

she bore depletory means for the pulmonic affection, and how imperfect her convalescence from that disease was, few, I believe, except perhaps a thorough disciple of Broussais, would have ventured to have had recourse to that remedy. At the same time it must be admitted that the old method of treating such cases by a round of stimulant and tonic medicines, would have been inevitably fatal in this, and that its favourable issue may be fairly attributed to adopting the more rational views of the physiological school.

ART. XII. *On Lithontripty*. By J. P. HOPKINSON, M. D. (Read before the Philadelphia Medical Society.)

THE operation of lithontripty, known more generally in this country as "CIVIALE'S operation," has, for some years past, occupied the public attention, to a great extent, attended, however, by such varied reports, that even medical men are somewhat at a loss to make up an opinion as to its value, since, while some writers tell us of the unparalleled success of Mr. Civiale, others give us accounts of repeated and decided failures. Thus, whatever success may in reality have attended this operation abroad, full confidence is not placed in it here, and many are disposed to abandon it altogether, because first attempts have not been crowned with that success to be attained only by careful and expert operators.

The idea of destroying a calculus within the body, is by no means of recent date, as is proved by reference to the writings of SANCTORIUS, ALBUCASIS, AMBROSE PARE, FRANCO, &c. and, in too well-known instances, those of the monk of Cîteaux, and Colonel Martin, calculi were actually broken up, or ground away, in the bladder.

Various plans have been suggested, founded upon chemical solution, the solvents to be applied, either directly, by injection into the bladder, or indirectly, through the medium of the circulation. Whatever the chemists may now effect in the latter way, and judging from what has been done, we are prepared for almost any thing; still there are abundant reasons for believing that this will not ultimately constitute the safest, or even an effectual means of getting rid of urinary calculi. It has been proposed likewise to catch the stone in a small bag introduced through a tube, and then to inject into this bag some powerful solvent, thus destroying the stone at once, without injuring the

bladder. The difficulties in the way of accomplishing this are obvious; and it is sufficient to say, that no means of obviating them have been, or seem likely to be, discovered. It thus seems probable that nothing will be effected by chemical solvents, and that we must resort to mechanical means; we shall proceed, therefore, to notice the instruments proposed for this purpose within a few years.

M. GRUTHUISEN, of Munich, was the first surgeon in modern times, who made any considerable step towards devising a mechanical means of destroying calculi in the urinary bladder. In a Memoir published in the *Medico-Chirurgical Journal*, of Saltzbourg, for March, 1813, he asks, "ought we to renounce the hope formerly entertained, of being able one day to destroy stones in the bladder by mechanical or chemical means?" He then goes on to observe—"During five years do I hesitate to promulgate my ideas on the artificial means proper for dissolving, and grinding stone in the bladder, waiting in vain for a favourable opportunity to make the application upon the living subject, before communicating it to the public. Besides, the stone being very rare in the environs of Munich, my scientific labours prevent me giving myself up to practice for some years past; and we know, moreover, how difficult it is to obtain a patient to serve as a trial for an operation not yet attempted. I have well weighed, and partly profited by the counsels given me, and the objections made by skilful physicians and surgeons—but I have, nevertheless, persevered in the project of publishing my ideas upon this subject, sustained as I was by the hope of succeeding, some day perhaps, in entirely erasing from the list of surgical operations, one so dangerous and severe as that of lithotomy. I will then expose to the public, as clearly as I can, what I consider in this affair as theoretically possible, and what can be obtained with mathematical certainty," &c. Again, "I shall present here only trials which have been made at times, or which can be executed in perfect safety." The plan which Gruithuisen had in view, was to dissolve a stone by passing a current of water upon it, which was to be kept up for some time; this he accomplished by means of two *straight* tubes, one within the other, so that the fluid, which descended by its gravity from a height, and which was brought to act upon the calculus, by means of one tube, had a ready exit by the other, and thus a constant stream was maintained. He says, that he has permitted cold well water to fall, guttatum, for twenty-four hours upon a fragment of stone composed of urate of ammonia. That this piece, which weighed a scruple before the operation, was reduced to nineteen and a half grains—that, not only was it reduced in bulk, but that it was more friable; and, that

he believes, in this operation, the gelatine to be dissolved, &c. He then adds, since cold water acts with so much power, when warmed its effect must be increased. To augment its dissolving power still more, he proposes adding such articles as may decompose the stone. To do this, it is required, of course, first to ascertain its composition. As regards the instrument, he says, "our plan is entirely founded upon the possibility of sounding male subjects with a straight catheter. But we are so much imbued with the ancient maxim, which requires that a catheter should imitate exactly the curvature of the urethra, that many practitioners cannot conceive it possible to introduce a straight sound into the bladder of a man, and declare that it is a thing absolutely impracticable. To this I answer that the thing must be practicable, since it has been done. I have myself introduced, without any difficulty, into the bladder of two living men, glass tubes, rounded at their anterior extremity, having three or four lines in diameter. I have done the same thing on the dead body, and believe, moreover, that it is much more easy to sound the bladder with a straight, than with a crooked catheter. I spoke of this—but they turned deaf ears to me: then, to confound the most incredulous, I resolved to prove my assertion by a public experiment." This was made, and all their doubts removed. He says further, "What I advance will appear less exaggerated, when we know that the Egyptians dilated the urethra, in such a manner, by means of sounds, that they could push the stone from the bladder into this canal by means of the finger passed into the anus." A fact attested by PROSPER ALPINUS. After describing the mode of introducing a straight sound, he adds—"Our intention is not to extract stones from the bladder, such as they are, in their natural magnitude, but only to divide them in the bladder by means of drills, or to soften and dissolve them by the aid of chemical agents." Again—"We can introduce, in most individuals, sounds from three to four lines in diameter, a size sufficient to attempt upon the stone all that is required to destroy it." He finally proposed to perforate the calculi with holes, in order more effectually to apply the solvent.

Mr. Gruithuisen next proceeds to describe the various instruments, of his own contrivance, for effecting the purposes he had detailed: and his memoir is accompanied by drawings of them, with minute descriptions of all their parts. He concludes by saying—"Other practitioners will not delay to perfect these instruments, and to invent others more convenient; for in the arts we arrive step by step, and in starting from a preconceived idea; whilst we do not reach to science but by the medium of experience." Fruitful in resources, he

proposes, in case of difficulty in catching a stone in the forceps, that it should be perforated by means of galvanism; and he describes instruments calculated to effect this end.

Such is the memoir of Gruithuisen, establishing beyond all doubt, the justness of his claims upon the French surgeons to originality. So early as the year 1803, his hopes were awakened of being able to relieve those labouring under the stone, without resorting to any dangerous operation, and they are likely in part to be realized.

Thus far did Gruithuisen go, but he did not procure a case for the trial of his plan, being too poor to incur the expense of making instruments, and being entirely unaided by his fellow practitioners, who had no confidence in the success of his proposal. In this state was the subject left dormant for some years, until it was revived in Paris by two gentlemen, Messrs. Leroy and Civiale, who are to this day disputing the point of priority. It appears, however, to be pretty well settled, that Mr. Civiale was the first in France to devise instruments for seizing and boring the stone, but that the merit of contriving the first complete apparatus, one susceptible of application, belongs to Mr. Leroy. Mr. Civiale and others have since variously modified or improved these instruments, and at present they have arrived at a considerable degree of perfection. Among the improvers of this operation is a German, BARON HEURTELoup, who has invented some instruments of a complicated nature, the mechanism of which he as yet keeps a secret, but which he has shown and used publicly at the Hospital of the School of Medicine, and at the Hôtel Dieu. He uses two distinct instruments: one for seizing and grinding a calculus when large, by successive perforations; the other for crushing it, if small, in a single operation. The latter, termed "*brise-pierre*," consists of a strong tube of the usual diameter, in which are enclosed two shafts or blades; these are attached to a handle at one end, by which they are moved, and terminate at the other, in two projecting scoops or spoon-like knobs, rough, and armed with small teeth on their inner surfaces; the movement by which they protrude from the tube, and which afterwards retracts them within it, is alternate; that is, first one blade is moved, then the other, and so on in succession. The object of this arrangement is, that all danger of including the coats of the bladder between them may be avoided, which advantage would not be so certainly attained, were they retracted together, an objection applicable to all other instruments of this nature. Having introduced this into the bladder and found the stone, the blades are opened by means of a crank attached to the handle, forming a very powerful lever; the stone, if small, is seized and

crushed into numberless small fragments. The hardness of the calculus is not at all a matter of consideration, size being the only bar to its application, for it is possessed of such great power as readily to destroy the hardest calculi that can form in the bladder. We witnessed its employment in one case, when a single introduction of the instrument succeeded completely in destroying the stone, which passed off in the course of the day, in the form of gravel. So easily was this accomplished, that the operator himself was not aware of what he had done, until afterwards, when the patient discovered in passing his urine, that this gravel made its appearance. On subsequent examination, no remnant of the former calculus was found.

Now, although this operation is a very ingenious one, yet it is evidently applicable to a very limited number of cases, to those only indeed which apply for relief, before the stone has attained a size greater than that of a filbert or hickory-nut, as beyond this, there would not be much probability of succeeding. Mr. AMUSSAT has a small instrument for extracting portions of calculi that may be arrested in the urethra; it appears to me dangerous, and likely to include the coats of that canal, and also of the bladder, if carried into it, with a view of catching small pieces of stones that have been ground or broken up. This is an insurmountable objection to its employment.

The instrument we shall next speak of is that of Mr. Leroy, as being, we think, more complete than that of Mr. C. who will not now adopt any improvements introduced by other persons. It is Mr. Leroy's instrument which I have seen frequently used, and which I have brought out with me, in the hope of our one day reaping some advantage in this country, from its general adoption. In England and Germany, as well as in France, it has already been successfully employed, and it is to be hoped that we will not be backward in giving a *fair trial* to the operation. This instrument consists of a silver tube nearly twelve inches in length, and about four lines in diameter, for a full grown man; for younger subjects it is made proportionably smaller—within this, is another tube made of steel, and terminating in three elastic prongs, which form the forceps for the purpose of catching and holding the stone. This second tube is much longer than the other first mentioned, and is moved within it, so that in protruding it, the three blades expand by their elasticity, and are closed again by drawing them within the silver tube. The stone being held in this manner by the forceps, a drill occupying the second tube, and turned by means of a pulley and bow, comes in contact with it, thus grinding the stone into a fine gravel. This drill is kept in contact with the stone, as the boring progresses by means of a wire

spring constantly pushing it forward. The whole instrument thus constituted, is attached to a handle, after its introduction, which is thus managed. The forceps embracing the projecting head of the drill, are closed in such a manner as to form a rounded knob, the irregularities of which are filled with tallow. The patient is placed on his back, near the lower part of the bed, the knees being bent, and the thighs drawn up towards the abdomen. The surgeon places himself directly opposite, at the foot of the bed, as if he were going to operate for lithotomy; in this way, every advantage is afforded the surgeon, who can handle his instruments with ease, both to himself and to his patient. A contrivance is sometimes used for supporting the patient's feet beyond the bed by means of small, flat foot-boards, attached by a screw, and removed at pleasure. This allows the operator to approach nearer to the patient, and consequently to have greater command of the instrument. Having passed the whole instrument, properly prepared, into the bladder, and the stone being felt, the forceps are expanded, and it is enclosed within their grasp. The drill is next put in action, and the operation completed by boring many holes in succession. The bladder, if possible, must be kept moderately distended with warm water, which can be injected through the silver tube, without withdrawing it. This mainly constitutes the process, which may be repeated any number of times required to effect the complete destruction of the calculus.

Added to this instrument, there is a drill of peculiar structure, which is introduced, like the others, and then by means of a screw in the handle, two prongs are made to protrude each half an inch, so that in causing them to project gradually, the stone is ultimately perforated by a hole, whose diameter would be an inch. Consequently, if a calculus have less diameter than an inch, it must be ground to pieces at once.

Such is the instrument best calculated among those at present *known*, to effect the end for which it is employed. That which I possess, was made under the immediate inspection of Mr. Leroy, and consequently wanting in nothing, as yet thought necessary to render it complete. From what I saw of Mr. Heurteloup's instrument, it appears to be superior to any other, having besides other improvements, an arrangement by which the stone can be turned in the forceps, so as to present another surface to the action of the drill, and this is done without letting it drop into the bladder. But his instruments are so complicated and difficult to manage, that he has determined, he informs me, their mechanism shall not be known, until a hospital has been granted him, where he can establish their merits,

before others have injured their character, by not understanding them.

I was much pleased with the facility with which Mr. Civiale invariably caught the stone. This is decidedly the greatest difficulty in the operation, and one which, in a great measure, has caused the numerous failures others have met with in this country and elsewhere. In one case, that of an elderly gentleman, which Mr. C. was kind enough to take me to witness, the whole operation, as well as I can recollect, did not occupy more than five minutes, from the introduction of the instrument, to its removal; this was the second application of it, and I afterwards learned, that at the next visit, no evidence of any calculus remaining in the bladder existed. Nothing but practice can enable a man to overcome this difficulty, as it is a peculiar tact, which but few can possess, and that to be obtained only by constantly handling the instruments. The torture which may be inflicted, or the comparative slight degree of pain experienced by the patient, will depend entirely upon the manner in which this is done; in fact, there is scarcely an operation in surgery requiring more skill and management than this, or in which the result so much depends upon the dexterity of the operator. This circumstance alone is sufficient to account for so many having failed, while Mr. C. was meeting with such success, as to attract patients from all parts; he has undoubtedly performed the operation more frequently and more successfully than any other practitioner in Europe. He has the credit of being the first to put Gruithuisen's new views to the test of experiment, and to succeed in establishing their value, and he has acquired a dexterity astonishing to all who witness his cases, and the ease with which he manages the instrument.

That each one may form his own conclusions on this subject, and examine facts apart from mere reputation, I will subjoin a summary of cases, published by Mr. Civiale himself.

In the early part of the year 1827, a letter was presented to the Academy of Sciences at Paris, by Mr. Heurteloup, who is a rival of Mr. C.'s, containing a review of his work. From this letter it appears that eighty-two cases had presented themselves to Mr. C. to be relieved from the stone. Of these, forty-eight were cured, thirty-one died, and three retained their calculi: of the forty-eight cured, forty were submitted to lithontripty only; the others were cut and the stone extracted. Again, of the thirty-one dead, eight died after Mr. C.'s attempts with his instruments. So that of forty-eight upon whom his instruments were employed, eight lost their lives, being one-sixth. This is certainly a very great proportion, but we must

recollect that this was prior to 1826, since which time important improvements have been introduced, and of course greater skill acquired.

This operation has been tried in several instances, in this city, by some of our most distinguished operators; in every case it was either fatal, (that is to say, the patient upon whom the trial was made, died a short time after,) or proving unsuccessful, it was abandoned, and the lateral operation resorted to. Now, notwithstanding the very different results in France, these failures have induced some to declare in round terms, that the operation will not succeed, and that lithotomy is still preferable. This is certainly a hasty and most unwarrantable conclusion; and yet I confess entertaining such sentiments myself, immediately subsequent to the first attempts made in this city; these prejudices were however dissipated by the cases which I subsequently witnessed.

Let us now consider the objections that have been advanced against the success of lithontripty. It is said to be more painful than lithotomy—more tedious and uncertain—dangerous from inflammation of the bladder—and very difficult in the performance, &c.

The first charge amounts to this, that patients who have had their bladders explored by rudely-formed instruments, in inexperienced hands, have suffered more pain than they afterwards felt on being cut for the stone. In lithontripty, both the pain and the success will depend upon the propriety of the instruments employed, and the dexterity and care with which they are used. The patient too, must be placed favourably for the surgeon, or he cannot use that dexterous manipulation so much required. It cannot be affirmed that the operation of lithontripty, and especially the first introduction of the instruments, is devoid of pain, for I have witnessed the contrary; but it is not always necessarily more painful than lithotomy.* I have seen it performed with scarcely any complaint of inconvenience escaping the patient, who meets his surgeon, for a repetition of the operation, without fear or hesitation. In the female subject, there would be very little inconvenience or difficulty in catching and destroying a calculus—at all events a better operation, and less painful than extracting it by the dilatation of the urethra.

In the second place, it has been urged that it is tedious in the per-

* While on the subject, I would suggest the propriety of using a weak solution of opium, which, being injected into the bladder, would probably diminish its too great sensibility; or, if preferred, a suppository of opium might be introduced into the rectum.

formance, and uncertain in the result. True, it often, yet not invariably, requires to be repeated; but it does not stand alone in surgery in this particular. An interval of a few days being allowed to take place between each boring, certainly retards the final cure, which sometimes, in irritable constitutions, requires some weeks; but in the mean time the patient is not always debarred from attending to his usual avocations: indeed, I have known a gentleman to get up from the bed, on which he has just been operated upon, and enjoy a walk with his surgeon, with as much ease and comfort as if nothing had been done. On this point then there can be no sort of comparison between the two operations. Who would not prefer this moderate inconvenience, without loss of liberty, to a close confinement to bed for two or three weeks? To this it may be replied, make this operation as *certain* as lithotomy, and devoid of its danger or severity, and there can be no diversity of sentiment as to a choice between them. But this constitutes another point, and will be presently examined, separately. It must be recollected, in speaking of lithontripty as tedious, that sometimes the stone is completely destroyed in a single operation, and when the stone is small, this may always be anticipated; many calculi too, are so soft, as easily to be broken up, even when of some considerable size, in two, or at most three, sittings.

In being *uncertain*, as has been alleged against lithontripty, it would only partake of the character of many other operations, which are nevertheless daily performed; but let us inquire in what respect it is uncertain. It is said that we cannot be sure of having removed every portion of the calculus, and that many small particles may thus remain, to form nuclei for subsequent depositions, and consequently a return of the disease in an aggravated form; we must then ascertain with what proof or probability *this* has been advanced. If subsequent experience shall prove it correct, this is a most important objection, and sufficient almost to destroy all confidence in the operation, unless it can by some means be overcome. But as yet we do not know of its having occurred, and therefore we can only say, that as far as our observation extends, in no one case which has been reported cured, could any trace of a portion of calculus remaining in the bladder be discovered, either by the sound, or by any symptoms on the part of the patient. So much for the proof; and as to the probability of such an occurrence, there is this against it: 1st, the feelings of the patient, whose bladder is likely soon to indicate the continued presence of an irritating body; and 2d, the instruments employed for exploring the bladder, are such as to touch in succession

every part, even when irregularly contracted. This charge then, may be dismissed with the single remark, that it is both unjust and premature, inasmuch as time alone can decide it.

But there is one circumstance not to be overlooked, for it is of no small importance, both to the patient and to the surgeon. The fragments of the stone, so far from remaining in the bladder, generally find their way very soon into the urethra, which is somewhat dilated by the lithonriptor, and sometimes are there arrested. Mr. Civiale, without any ceremony, proceeds immediately to extract them by means of a single blade, or prong of similar construction, with the forceps, that is, straight, with the extremity slightly curved inwards. In doing this, I have seen him not only inflict great pain upon his patient, but even draw blood in dragging the fragment along the urethra. The case in which this occurred, was a man in the hospital La Pitié, upon whom Mr. C. operated about ten times, six of which I witnessed. The patient entirely recovered. Several instruments have been contrived for the extraction of these fragments, such as those of Mr. Amussat, Sir A. Cooper, &c. &c. but not, as far as I am acquainted, with decided success. Mr. COSTELLO, a pupil of Mr. Civiale, has lately invented an instrument which I have not seen.

In the third place, it is said that the operation is *dangerous*, and liable to produce inflammation of the bladder, and perhaps sometimes death. To say nothing of the fact, that this inference is drawn from imperfect trials, with still more imperfect means; it may be observed, that, like most other operations, the danger will in a measure depend upon the skill and capability of the operator. One or two cases are reported in this city, and some others in Europe, which terminated fatally, subsequent to trials made to destroy the stone in the bladder. Although it is by no means ascertained what was the immediate cause of death in these instances, yet there seems a disposition to attribute them in a great measure to injury done to the bladder, by the instruments employed. Be this as it may, the observations already made in relation to the very imperfect and incompetent instruments employed, and the difficulties consequent upon a limited experience, will apply in this place, nor can we possibly hope for success, without enlisting every advantage in our favour. Mr. Civiale, according to his own reports, has lost patients after the operation, but as the minute details of these cases are not known, I am not prepared to say how far it was instrumental in producing death.

There is something not a little curious in the proximate cause of death in these cases. How is it, that irritation of the mucous coat of the bladder, for we know it may and does exist, without implicating

the peritoneal covering; how is it, that this simple irritation, without even becoming inflammation, produces death? By way of illustration, the following case, extracted from Hufeland's Journal of last year, may be adduced. Several fruitless attempts were made in a patient to catch a stone with the lithontriptor, but it always slipped from the forceps, and after causing a good deal of pain, the attempt was abandoned; the patient was soon after attacked with anxiety, restlessness, &c. and about the fourth day expired. Upon examination, no marks whatever of *inflammation* existed in the bladder, which contained a stone much too large for the forceps to embrace; all the abdominal and thoracic viscera were in a healthy condition; but the brain was completely gorged with blood, in fact apoplectic, to which they attributed his death. If this be correct, how, I ask, is this irritation conveyed from one organ, which it leaves in a sound state, to another which it fatally disorganizes?

The operation of lithontripty may be said to be still in its infancy, admitting yet of great improvements; I do not however hesitate, most unequivocally to declare, as my conscientious belief, that even at this time, with a judicious selection of cases, a proper set of instruments, made with all the improvements lately adopted, and the requisite degree of caution in their application, no unhappy results will occur, to destroy the pleasing anticipations now entertained by many on this subject.

As to the last charge of difficulty in the performance, I shall not be expected to say much in relation to it; the difficulty of any operation will only tend to take it out of the hands of the many, and to place it in the power of a few, who will persevere to overcome every obstacle, and who therefore must finally succeed.

I have thus far been endeavouring to defend this new operation from unmerited censure and most unjust condemnation; but that I may not be accused of running into the opposite extreme, I will close these remarks by subjoining a conclusion drawn from what I have myself witnessed, aided by the evidence of some of my friends. In the first place, it is not to be denied, that, at the present day, the cases to which lithontripty is applicable with a probability of success, are comparatively few; but it so happens, that the faith necessary to gain cases for trial, constitutes the principal mean by which its subsequent fame must be supported; for, as the operation gains in the public confidence, so will cases present themselves in the first stage of the disease, and of course more favourable for success; and were this operation sufficiently known and confided in, to induce patients to apply early for relief, that is, upon the first occurrence of the

symptoms, a large majority of cases would most indubitably be effectually cured. Persons would not then allow a stone to increase in the bladder, year after year, from dread of a terrible operation; for *cutting*, in the eyes of the world, is always a dreadful affair, however insignificant the operation may in reality be. It is this inducement, to early application, for the removal of urinary calculi, that is the great claim, lithontripty has to our serious attention. A case that might be considered best adapted to the complete success of this operation, and with comparative little inconvenience to the patient, is as follows:—1st. Where the stone is not flat and thin, resembling a piece of slate, where it is not adherent, or encysted, and is not larger than an ordinary-sized shell-bark, for then it can mostly be destroyed in one or two sittings; not forgetting, however, that much larger stones have been destroyed. 2dly. Where the bladder is, to a certain extent, in a sound state, free from incrustations, which can only be removed by lithotomy, but principally in being devoid of irritation, so common in cases of long standing. 3dly. Where the urethra and prostate gland are sufficiently free from disease to allow of the introduction of the instruments. To these observations I have only to add, that, where the calculus is of a soft or friable texture, even though of some size, it might be destroyed at once, whereas in lithotomy there is no distinction of cases, since every stone requiring an operation subjects the patient to precisely the same danger.

There appears every reason to believe, that in the hands of a man of discrimination and judgment, and with a proper selection of cases, the operation of lithontripty ought not to fail once in a hundred cases, and it ought never to prove fatal, or even to effect any serious injury; this, however, cannot be anticipated, taking all cases as they occur, and there will still be left for the operation of lithotomy, many cases totally unmanageable by these instruments; as where the stone is too large, or encysted, where the bladder is too irritable, or incrustated with a calcareous deposit, where the prostate is diseased, &c. &c. I wish therefore to be considered, not a blind enthusiast, boldly recommending this operation, as suitable to every case of stone; and as calculated to supersede every other, but rather as one disposed to cherish the improvements of our art, and convinced of the public benefit to be derived from a judicious use of instruments, and other means, for destroying a stone within the bladder.